

WHAT IS CLAIMED IS:

1. A method for detecting similar time series of a pair of time series patterns, with the time series patterns being time series of vectors, said method comprising:

a vector decision step of calculating the degree of similarity between a pair of vectors of said paired time series patterns and giving a decision as to whether or not said paired vectors are similar to each other, based on said degree of similarity; and

a time series decision step of counting the number of similar vectors decided to be similar and/or dissimilar vectors decided to be dissimilar in said vector decision step and giving a decision as to whether or not the paired time series patterns are similar, based on the results of the counting.

2. The method for detecting similar time series according to claim 1, wherein said degree of similarity is the distance between said paired vectors.

3. The method for detecting similar time series according to claim 2, wherein said vector decision step includes a hierarchical distance calculating step of hierarchically calculating the distance between said paired vectors, a threshold value comparing step of comparing an integrated distance value calculated in each hierarchy of said hierarchical distance calculating step to a first threshold value pertinent to the distance and a decision step of determining whether or not said paired vectors are similar to each other, responsive to the results of comparison in said threshold comparing step; wherein

if, in said threshold comparing step, the integrated distance value calculated

up to the last hierarchy is smaller than said first threshold value, said paired vectors are determined to be similar in said decision step, and wherein, if integrated distance value calculated up to a given hierarchy exceeds said first threshold value, said paired vectors are determined to be dissimilar, and control is performed to discontinue the distance calculations for the remaining hierarchies.

4. The method for detecting similar time series according to claim 3, wherein, in said hierarchical distance calculating step, the distance between components making up the paired vectors is calculated hierarchically, and wherein, if, in said threshold comparing step, the integrated distance value calculated up to a given hierarchy is lower than the first threshold value, the next calculations of the distance between the components are carried out.

5. The method for detecting similar time series according to claim 4, wherein said vector decision step further includes a transform step of applying a preset transform to said paired vectors; and wherein

in said hierarchical distance calculating step, the distance between the paired vectors, transformed by said transform step, is calculated in a preset sequence which is based on said preset transform.

6. The method for detecting similar time series according to claim 5, wherein said preset transform is a transform of re-arraying said components making up said paired vectors in the order of the magnitudes of the variance of said components; and wherein

in said hierarchical distance calculating step, the distance between the paired vectors, transformed by said transform step, is calculated in the order of the decreasing magnitudes of the variance of the components.

7. The method for detecting similar time series according to claim 5, wherein said preset transform is the discrete cosine transform or the discrete Fourier transform; and wherein

in said hierarchical distance calculating step, the distance calculations between the paired vectors transformed by said transform step are carried out sequentially beginning from the low frequency components.

8. The method for detecting similar time series according to claim 5, wherein said preset transform is the Walsh-Hadamard transform; and wherein

in said hierarchical distance calculating step, the distance calculations between the paired vectors transformed by said transform step are carried out sequentially beginning from the low frequency components.

9. The method for detecting similar time series according to claim 5, wherein said preset transform is the Karhunen-Loeve transform; and wherein

in said hierarchical distance calculating step, the distance calculations between the paired vectors transformed by said transform step are carried out sequentially beginning from components of high characteristic value.

10. The method for detecting similar time series according to claim 5, wherein said vector decision step further includes a splitting step of taking out components making

up each of said paired vectors, transformed by said transform step, in said preset sequence, and splitting said component into a plurality of hierarchical partial vectors; and wherein

in said hierarchical distance calculating step, distance calculations between the respective components forming partial vectors are carried out hierarchically beginning from the partial vector of the uppermost hierarchy; when the integrated value of the distance calculated for the totality of the components making up the partial vectors up to a given hierarchy is lower than said first threshold value, the distance calculations between the components forming the partial vectors of the hierarchy lower by one hierarchy are carried out.

11. The method for detecting similar time series according to claim 1, wherein said time series decision step includes a hierarchical counting step of hierarchically counting the number of said similar vectors and/or said dissimilar vectors, a threshold value comparing step of comparing an integrated value of the number of said similar vectors and/or said dissimilar vectors, obtained in each hierarchy of said hierarchical counting step, to a second threshold value of the number of similar vectors, and a decision step of determining the similarity of said paired time series patterns, responsive to the results of comparison in said threshold value comparing step; wherein

if, in said threshold value comparing step, the integrated value of the number of said similar vectors calculated up to the last hierarchy is larger than said second

threshold value, said paired time series patterns are determined to be similar in said decision step, and wherein, if the integrated value of the number of the dissimilar vectors, calculated up to a given hierarchy, exceeds the total number of said vectors in said time series pattern less said second threshold value, said paired time series patterns are determined to be dissimilar, and control is performed to discontinue the calculations for the remaining hierarchies.

12. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of audio signals, and

wherein said time series pattern is a time series of vectorized power spectrum coefficients in a preset time domain of said audio signals.

13. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of audio signals, and

wherein said time series pattern is a time series of vectorized linear predictive coefficients in a preset time domain of said audio signals.

14. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of encoded audio signals, and

wherein said time series pattern is a time series of vectorized parameters representing the intensity of the frequency components in each frame of said encoded audio signals.

15. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of video signals, and

wherein said time series pattern is a time series of vectorized signal values of a representative picture in a preset time domain of said video signals, an average picture of frame pictures in said preset time domain or a small-sized picture, obtained on splitting said representative picture or said average picture in terms of a preset block as a unit.

16. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of video signals, and

wherein said time series pattern is a time series of vectorized histograms for luminance and/or chroma in a frame picture in a preset time domain of said video signals.

17. The method for detecting similar time series according to claim 1, wherein said vector is the vectorized features of encoded video signals, and

wherein said time series pattern is a time series of vectorized signal values of DC components of respective blocks as encoding units of an intra-frame encoded picture in direct proximity of a preset time domain of said encoded video signals.

18. The method for detecting similar time series according to claim 1, wherein one of said paired time series patterns is sliced from a time series of a vector longer than said time series patterns and wherein similarity is sequentially checked as the slicing position is updated.

19. An apparatus for detecting similar time series of a pair of time series patterns, with the time series patterns being time series of vectors, said apparatus comprising:

vector decision means for calculating the degree of similarity between a pair of vectors of said paired time series patterns and giving a decision as to whether or not said paired vectors are similar to each other, based on said degree of similarity; and

time series decision means for counting the number of similar vectors decided to be similar and/or dissimilar vectors decided to be dissimilar in said vector decision means and giving a decision as to whether or not the paired time series patterns are similar, based on the results of the counting.

20. The apparatus for detecting similar time series according to claim 19, wherein said degree of similarity is the distance between said paired vectors.

21. The apparatus for detecting similar time series according to claim 20, wherein said vector decision means includes hierarchical distance calculating means for hierarchically calculating the distance between said paired vectors, threshold value comparing means for comparing an integrated distance value calculated in each hierarchy of said hierarchical distance calculating means to a first threshold value pertinent to the distance, and decision means for determining whether or not said paired vectors are similar to each other, responsive to the results of comparison in said threshold comparing means; wherein

in said decision means, if, as a result of comparison by said threshold comparing means, the integrated distance value calculated up to the last hierarchy is smaller than said first threshold value, said paired vectors are determined to be similar, and wherein, if an integrated distance value calculated up to a given hierarchy

exceeds said first threshold value, said paired vectors are determined to be dissimilar, and control is performed to discontinue the distance calculations for the remaining hierarchies.

22. The apparatus for detecting similar time series according to claim 21 wherein said hierarchical distance calculating means calculates the distance between components making up the paired vectors hierarchically, and wherein, if, as a result of comparison by said threshold comparing means, the integrated distance value calculated up to a given hierarchy is lower than the first threshold value, the next calculations of the distance between the components are carried out.

23. The apparatus for detecting similar time series according to claim 22, wherein said vector decision means further includes a transform means for applying a preset transform to said paired vectors, and wherein said hierarchical distance calculating means calculates the distance between the paired vectors, transformed by said transform means, in a preset sequence which is based on said preset transform.

24. The apparatus for detecting similar time series according to claim 23, wherein said vector decision means further includes splitting means for taking out components making up each of said paired vectors, transformed by said transform means, in said preset sequence, and splitting said components into a plurality of hierarchical partial vectors, wherein said hierarchical distance calculating means executes distance calculations between the respective components forming partial vectors hierarchically beginning from the partial vector of the uppermost hierarchy, and wherein the

distance calculations between the components forming the partial vectors of the hierarchy lower by one hierarchy are carried out when the integrated value of the distance calculated for the totality of the components making up the partial vectors up to a given hierarchy is lower than said first threshold value.

25. The apparatus for detecting similar time series according to claim 19 wherein said time series decision means includes hierarchical counting means for hierarchically counting the number of said similar vectors and/or said dissimilar vectors, threshold value comparing means for comparing an integrated value of the number of said similar vectors and/or said dissimilar vectors, obtained in each hierarchy of said hierarchical counting means, to a second threshold value of the number of similar vectors, and decision means for determining the similarity of said paired time series patterns, responsive to the results of comparison in said threshold value comparing means, wherein

if, as a result of comparison by said threshold value comparing means, the integrated value of the number of said similar vectors calculated up to the last hierarchy is larger than said second threshold value, said decision means determines the paired time series patterns to be similar, and wherein, if the integrated value of the number of the dissimilar vectors, calculated up to a given hierarchy, exceeds the total number of said vectors in said time series pattern less said second threshold value, said decision means determines the paired time series patterns to be dissimilar, and control is performed to discontinue the distance calculations for the remaining

hierarchies.

26. A program for having a computer execute the processing of detecting similar time series of a pair of time series patterns, with the time series patterns being time series of vectors, said program comprising:

a vector decision step of calculating the degree of similarity between a pair of vectors of said paired time series patterns and giving a decision as to whether or not said paired vectors are similar to each other, based on said degree of similarity; and

a time series decision step of counting the number of similar vectors decided to be similar and/or dissimilar vectors decided to be dissimilar in said vector decision step and giving a decision as to whether or not the paired time series patterns are similar, based on the results of the counting.

27. The program for detecting similar time series according to claim 26, wherein said degree of similarity is the distance between said paired vectors.

28. The program for detecting similar time series according to claim 27, wherein said vector decision step includes a hierarchical distance calculating step of hierarchically calculating the distance between said paired vectors, a threshold value comparing step of comparing an integrated distance value calculated in each hierarchy of said hierarchical distance calculating step to a first threshold value pertinent to the distance and a decision step of determining whether or not said paired vectors are similar to each other, responsive to the results of comparison in said threshold comparing step; wherein

if, in said threshold comparing step, the integrated distance value calculated up to the last hierarchy is smaller than said first threshold value, said paired vectors are determined to be similar in said decision step, and wherein, if an integrated distance value calculated up to a given hierarchy exceeds said first threshold value, said paired vectors are determined to be dissimilar, and control is performed to discontinue the distance calculations for the remaining hierarchies.

29. The program for detecting similar time series according to claim 28, wherein, in said hierarchical distance calculating step, the distance between components making up the paired vectors is calculated hierarchically; if, in said threshold comparing step, the integrated distance value calculated up to a given hierarchy is lower than the first threshold value, the next calculations of the distance between the components are carried out.

30. The program for detecting similar time series according to claim 29, wherein said vector decision step further includes a transform step of applying a preset transform to said paired vectors; and wherein

in said hierarchical distance calculating step, the distance between the paired vectors, transformed by said transform step, is calculated in a preset sequence which is based on said preset transform.

31. The program for detecting similar time series according to claim 30, wherein said vector decision step further includes a splitting step of taking out components making up each of said paired vectors, transformed by said transform step, in said preset

sequence, and splitting said component into a plurality of hierarchical partial vectors; and wherein

in said hierarchical distance calculating step, distance calculations between the respective components forming partial vectors are carried out hierarchically beginning from the partial vector of the uppermost hierarchy; when the integrated value of the distance calculated for the totality of the components making up the partial vectors up to a given hierarchy is lower than said first threshold value, the distance calculations between the components forming the partial vectors of the hierarchy lower by one hierarchy are carried out.

32. The program for detecting similar time series according to claim 26, wherein said time series decision step includes a hierarchical counting step of hierarchically counting the number of said similar vectors and/or said dissimilar vectors, a threshold value comparing step of comparing an integrated value of the number of said similar vectors and/or said dissimilar vectors, obtained in each hierarchy of said hierarchical counting step, to a second threshold value of the number of similar vectors, and a decision step of determining the similarity of said paired time series patterns, responsive to the results of comparison in said threshold value comparing step, wherein

if, in said threshold value comparing step, the integrated value of the number of said similar vectors calculated up to the last hierarchy is larger than said second threshold value, said paired time series patterns are determined to be similar in said

decision step, and wherein, if the integrated value of the number of the dissimilar vectors, calculated up to a given hierarchy, exceeds the total number of said vectors in said time series pattern less said second threshold value, said paired time series patterns are determined to be dissimilar, and control is performed to discontinue the calculations for the remaining hierarchies.

33. A computer-controllable recording medium having recorded thereon a program for having a computer execute the processing of detecting similar time series of a pair of time series patterns, with the time series patterns being time series of vectors, said program comprising:

- a vector decision step of calculating the degree of similarity between a pair of vectors of said paired time series patterns and giving a decision as to whether or not said paired vectors are similar to each other, based on said degree of similarity; and

- a time series decision step of counting the number of similar vectors decided to be similar and/or dissimilar vectors decided to be dissimilar in said vector decision step and giving a decision as to whether or not the paired time series patterns are similar, based on the results of the counting.

34. The recording medium according to claim 33, wherein said degree of similarity is the distance between said paired vectors.

35. The recording medium according to claim 34, wherein said vector decision step includes a hierarchical distance calculating step of hierarchically calculating the distance between said paired vectors, a threshold value comparing step of comparing

an integrated distance value calculated in each hierarchy of said hierarchical distance calculating step to a first threshold value pertinent to the distance and a decision step of determining whether or not said paired vectors are similar to each other, responsive to the results of comparison in said threshold comparing step; wherein

if, in said threshold comparing step, the integrated distance value calculated up to the last hierarchy is smaller than said first threshold value, said paired vectors are determined to be similar in said decision step, and wherein, if an integrated distance value calculated up to a given hierarchy exceeds said first threshold value, said paired vectors are determined to be dissimilar, and control is performed to discontinue the distance calculations for the remaining hierarchies.

36. The recording medium according to claim 35, wherein, in said hierarchical distance calculating step, the distance between components making up the paired vectors is calculated hierarchically, and wherein, if, in said threshold comparing step, the integrated distance value calculated up to a given hierarchy is lower than the first threshold value, the next calculations of the distance between the components are carried out.

37. The recording medium according to claim 35, wherein said vector decision step further includes a transform step of applying a preset transform to said paired vectors; and wherein

in said hierarchical distance calculating step, the distance between the paired vectors, transformed by said transform step, is calculated in a preset sequence which

is based on said preset transform.

38. The recording medium according to claim 37, wherein said vector decision step further includes a splitting step of taking out components making up each of said paired vectors, transformed by said transform step, in said preset sequence, and splitting said component into a plurality of hierarchical partial vectors; and wherein

in said hierarchical distance calculating step, distance calculations between the respective components forming partial vectors are carried out hierarchically beginning from the partial vector of the uppermost hierarchy; when the integrated value of the distance calculated for the totality of the components making up the partial vectors up to a given hierarchy is lower than said first threshold value, the distance calculations between the components forming the partial vectors of the hierarchy lower by one hierarchy are carried out.

39. The recording medium according to claim 33, wherein said time series decision step includes a hierarchical counting step of hierarchically counting the number of said similar vectors and/or said dissimilar vectors, a threshold value comparing step of comparing an integrated value of the number of said similar vectors and/or said dissimilar vectors, obtained in each hierarchy of said hierarchical counting step, to a second threshold value of the number of similar vectors, and a decision step of determining the similarity of said paired time series patterns, responsive to the results of comparison in said threshold value comparing step, wherein

if, in said threshold value comparing step, the integrated value of the number

of said similar vectors calculated up to the last hierarchy is larger than said second threshold value, said paired time series patterns are determined to be similar in said decision step, and wherein, if the integrated value of the number of the dissimilar vectors, calculated up to a given hierarchy, exceeds the total number of said vectors in said time series pattern less said second threshold value, said paired time series patterns are determined to be dissimilar, and control is performed to discontinue the calculations for the remaining hierarchies.